

Volume – Cylinders & Cones

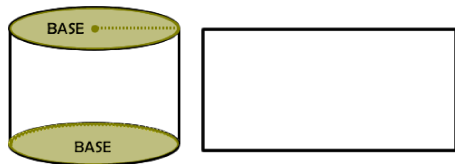
G.GMD.A.3

Notes Section 17.2

Name _____

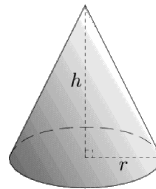
Volume of a Cylinder

$$V_{\text{cylinder}} = Bh = \pi r^2 h$$



Volume of a Cone

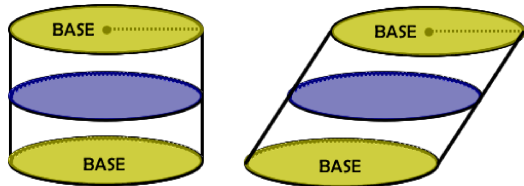
$$V_{\text{cone}} = \frac{1}{3}Bh = \frac{1}{3}\pi r^2 h$$



Cavalieri's Principle

Bonaventura Francesco Cavalieri (1598-1647)

If the areas of the cross sections of two solids by any plane parallel to a given plane are invariably equal, then the two solids have the same volume.



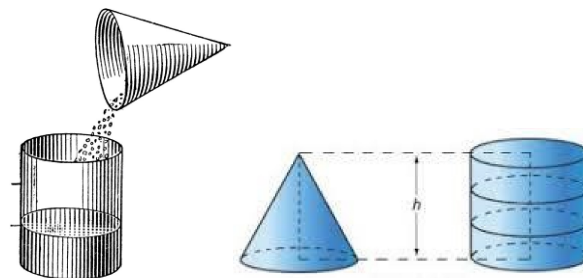
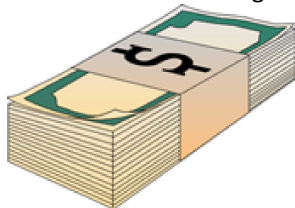
A Stack of CD Cases
Cross Section: Square



Stack of Crackers
Cross Section: Circle

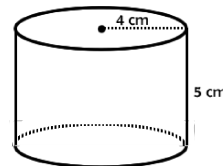


A Stack of Money
Cross Section: Rectangle



Determine the volume of the following.

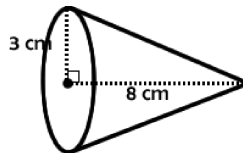
1.



$$\begin{aligned} B &= \pi r^2 \\ &= \pi (4)^2 \\ B &= 16\pi \end{aligned}$$

$$\begin{aligned} V_B &= B \cdot h \\ &= 16\pi (5) \\ V_B &= 80\pi \text{ cm}^3 \end{aligned}$$

2.



$$\begin{aligned} B &= \pi r^2 \\ &= \pi (8)^2 \\ B &= 64\pi \end{aligned}$$

$$\begin{aligned} V_B &= \frac{1}{3}Bh \\ &= \frac{1}{3}(64\pi) \cdot 3 \\ V_B &= 64\pi \text{ cm}^3 \end{aligned}$$

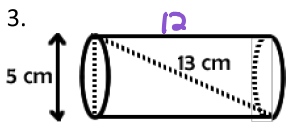
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PT
5-12-13



$$V_{\text{cyl}} = B \cdot h$$

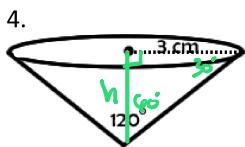
$$= \left(\frac{25}{4}\pi\right) (12)$$

$$B = \pi r^2$$

$$= \pi \left(\frac{5}{2}\right)^2$$

$$B = \frac{25}{4}\pi$$

$$V_{\text{cyl}} = 75\pi \text{ cm}^3$$



$$V_{\text{cone}} = \frac{1}{3} B \cdot h$$

$$= \frac{1}{3} (9\pi) \cdot \sqrt{3}$$

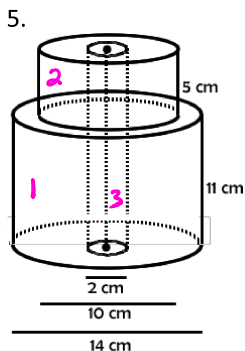
30-40-90°
x - x√3 - 2x
h · √3 = 3
h = 3/√3
h = 3√3/3
h = √3

$$B = \pi r^2$$

$$= \pi (3)^2$$

$$B = 9\pi$$

$$V_{\text{cone}} = 3\sqrt{3}\pi \text{ cm}^3$$



$$B_1 = \pi r^2 = \pi (7)^2 = 49\pi$$

$$B_2 = \pi r^2 = \pi (3)^2 = 9\pi$$

$$B_3 = \pi r^2 = \pi (2)^2 = 4\pi$$

$$B = \pi$$

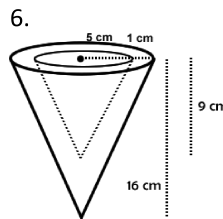
$$V_{\text{solid}} = V_1 + V_2 - V_3$$

$$= B_1 h_1 + B_2 h_2 - B_3 h_3$$

$$= (49\pi) \cdot (11) + (9\pi) \cdot (5) - (4\pi) \cdot (4)$$

$$= 539\pi + 45\pi - 16\pi$$

$$V_{\text{solid}} = 648\pi \text{ cm}^3$$



$$B_1 = \pi r^2 = \pi (6)^2 = 36\pi \text{ cm}^2$$

$$B_2 = \pi r^2 = \pi (5)^2 = 25\pi \text{ cm}^2$$

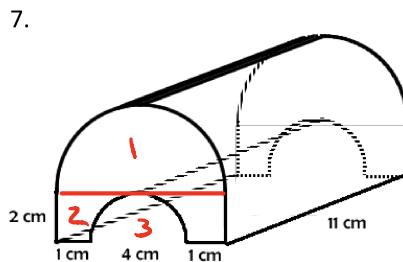
$$V_{\text{fig}} = \frac{1}{3} V_1 - \frac{1}{3} V_2$$

$$= \frac{1}{3} B_1 h_1 - \frac{1}{3} B_2 h_2$$

$$= \frac{1}{3} (36\pi) (16) - \frac{1}{3} (25\pi) (9)$$

$$= 192\pi - 75\pi$$

$$V_{\text{fig}} = 117\pi \text{ cm}^3$$



$$B = A_1 + A_2 - A_3$$

$$= \frac{1}{2} \pi r^2 + bh - \frac{1}{2} \pi r^2$$

$$= \frac{1}{2} \pi (3)^2 + 2(4) - \frac{1}{2} \pi (2)^2$$

$$= \frac{9}{2}\pi + 12 - 2\pi$$

$$= 4.5\pi + 12 - 2\pi$$

$$B = 2.5\pi + 12$$

$$V = B \cdot h$$

$$= (2.5\pi + 12)(11)$$

$$V = (27.5\pi + 132) \text{ cm}^3$$